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In the Claims

Please amend claims 1, 8, 9, 11, 15 through 17 and 19 and
cancel claims 2 through 7, 10 and 11 as follows:

1 (amended). A method for determining a seek time required
for moving a disk head between first and second addresses on a
physical disk drive including multiple logical volumes, said
method comprising the steps of:

- A) dividing the disk into a plurality of segments, each
segment having a given size and being defined by
first and second boundaries of a plurality of
contiguous tracks,
- B) establishing an array of actual seek times for seek
operations between each segment pair based upon the
first and second boundaries,
- C) generating a seek time for disk head movement between
the first and second addresses by linearly
interpolating the array of actual seek times based
upon the first and second addresses, said
interpolation being based on a Ratio Theorem analysis
using a center location of each segment as the
reference location for disk seek operations between
different logical volumes.

2-7 (canceled).

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8 (amended). A method as recited in claim [[6]]1 wherein
[the physical disk drive includes a data block and] said
interpolation uses the boundaries of [the data block]a logical
volume to obtain a disk seek time for seek operations within
the [data block]logical volume.

9 (twice amended). A method for determining the seek time over
a time interval for a physical disk drive configured to store
data in a plurality of logical volumes[over a time interval],
said method comprising the steps of:

A) dividing the physical disk into a plurality of fixed
sized segments independently of the logical volume
configuration on the physical disk drive wherein each
segment has a plurality of contiguous tracks,

B) determining actual seek times for seek operations
between the segments by,

i) assigning a predetermined seek time for each
seek operation between two segment boundaries.
ii) calculating an intrasegment seek time based upon
the predetermined seek times, and
iii) placing the predetermined seek times in a two-
dimensional array with the rows and columns defined by the
segment boundaries.

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- C) accumulating statistics for each access to each logical volume during the time interval,
- D) converting the accumulated statistics into an estimated number of seeks between each pair of logical volumes,
- E) defining a seek time for each logical volume pair based upon said actual segment seek times, and
- F) generating a total seek time as the sum of the products, for each logical volume pair, of the actual seek time for and the estimated number of seeks between each logical volume in the logical volume pair over the time interval.

10 and 11 (canceled).

12 (previously presented). A method as recited in claim 9 wherein said accumulation of statistics includes segregating each access to a logical volume into one of predetermined classes of accesses and weighting the numbers of accesses in each predetermined class.

13 (previously presented). A method as recited in claim 12 wherein said segregation of accesses is into one of random read, write and sequential prefetch read classes with weightings of 1.0, 0.5 and 0.25, respectively.

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14 (previously presented). A method as recited in claim 13 wherein A_i and A_j represent the weighted access to logical volumes i and j , and A represents the weighted sum of all the accesses to the physical disk drive and wherein the estimated number of disk accesses for the logical volume pair being given by:

$$Nr\ seeks(i,j) = \frac{A_i A_j}{A}$$

15 (amended). A method as recited in claim 9 wherein said [definition] determination of each actual seek time comprises determining the seek time between a center location of each of the logical volumes in the logical volume pair.

16 (amended). A method as recited in claim 15 wherein said [definition] determination of each actual seek time includes interpolating the seek times determined for seek operations between the segments based upon the center locations.

17 (amended). A method as recited in claim 15 wherein said [definition] determination of each actual seek time includes the step of linearly interpolating the seek times determined for seek operations between the segments based upon the center locations.

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18 (previously presented). A method as recited in claim 15 wherein A_i and A_j represent the weighted access to logical volumes i and j , respectively, and A represents the weighted sum of all the accesses to the physical disk drive and wherein the estimated seek time for the logical volume pair is given by:

$$\text{Seek time } (i,j) = t_{i,j} \frac{A_i A_j}{A}$$

19 (amended). A method as recited in claim 9 additionally comprising the step of determining an intravolume [the time for a]seek [operation]time within a logical volume.

20 (previously presented). A method as recited in claim 19 wherein said determination of intravolume seek time for a logical volume includes defining the boundaries of the logical volume relative to the segment boundaries and determining the seek time between the logical volume boundaries.

21 (previously presented). A method as recited in claim 20 wherein said definition of intravolume seek time includes interpolating the seek times determined for seek operations between the segments based upon the logical volume boundary locations.

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22 (previously presented). A method as recited in claim 20 wherein said definition of seek time includes the step of linearly interpolating the seek times determined for seek operations between the segments based upon the logical volume boundary locations.

23 (previously presented). A method for determining the seek time over a time interval for a physical disk drive configured to store data in a plurality of logical volumes, said method comprising the steps of:

- A) dividing the physical disk into a plurality of fixed sized segments characterized by boundaries independently of the logical volume configuration on the physical disk drive,
- B) determining seek times for seek operations between the segments by assigning empirically derived seek times between two segment boundaries,
- C) accumulating statistics for each access to each logical volume during the time interval,
- D) converting the accumulated statistics into an estimated number of seeks between each pair of logical volumes by weighting the numbers of accesses in each of different predetermined classes,
- E) defining a seek time for each logical volume pair based upon said segment seek times by using the

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center locations of each logical volume to
interpolate the seek times determined for seek
operations between the segments, and

- F) generating a total seek time that is the sum of the
seek times for each logical volume pair obtained as a
function of the estimated number of seeks and the
defined seek time for the logical volume pair.

24 (previously presented). A method as recited in claim 23
wherein each of said center locations is given as an offset
from a segment boundary according to:

$$p = x - \lfloor x \rfloor$$

and

$$q = \lceil y \rceil - y$$

where x and y represent center line locations of logical
volumes, $\lfloor x \rfloor$ and $\lceil y \rceil$ represent "floor of x " and "ceiling of y "
functions for the values of x and y based upon the boundaries
of the segments and p and q represent the displacements of the
center line addresses for each logical volume relative to a
segment boundary.

25 (previously presented). A method as recited in claim 24
wherein said definition of seek time for each logical volume
includes the step of generating a seek time according to:

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$$\begin{aligned}
 t_{ij} = & pq \text{ time}(\lfloor x \rfloor + 1, \lceil y \rceil - 1) \\
 & + p(1-q) \text{ time}(\lfloor x \rfloor + 1, \lceil y \rceil) \\
 & + (1-p)q \text{ time}(\lfloor x \rfloor, \lceil y \rceil - 1) \\
 & + (1-p)(1-q) \text{ time}(\lfloor x \rfloor, \lceil y \rceil)
 \end{aligned}$$

where t_{ij} represents the seek time for a specific pair of logical volumes and time is the seek interval for the corresponding relationship.

26 (previously presented). A method for determining the seek time over a time interval for a logical volume on a physical disk drive configured to store data in at least one logical volume, said method comprising the steps of:

- A) dividing the physical disk into a plurality of fixed sized segments independently of the logical volume configuration on the physical disk drive,
- B) determining seek times for seek operations between the segments by assigning empirically derived seek times between two segment boundaries,
- C) accumulating statistics for each access to the logical volume during the time interval,
- D) converting the accumulated statistics into an estimated number of seeks between locations within

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- the logical volume by weighting the numbers of accesses in each of different predetermined classes,
- E) defining a seek time for the logical volume pair based upon said segment seek times by using the boundary locations of the logical volume to interpolate the seek times determined for seek operations between the segments, and
- F) generating a total logical volume seek time that depends upon the number of accesses to the logical volume and the seek times between the boundary locations for the logical volume.

27 (previously presented). A method as recited in claim 26 wherein each of the boundary locations is given as an offset from a segment boundary according to:

$$p = x - \lfloor x \rfloor$$

and

$$q = \lceil y \rceil - y$$

where x and y represent center line locations of logical volumes, $\lfloor x \rfloor$ and $\lceil y \rceil$ represent "floor of x " and "ceiling of y " functions for the values of x and y based upon the boundaries of the segments and p and q represent the displacements of the center line addresses for each logical volume relative to a segment boundary.

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28 (previously presented). A method as recited in claim 27 wherein said definition of seek time for intravolume seeks includes the step of generating a seek time according to:

$$\begin{aligned}
 t_{i,j} = & pq \text{ time}(\lfloor x \rfloor + 1, \lceil y \rceil - 1) \\
 & + p(1-q) \text{ time}(\lfloor x \rfloor + 1, \lceil y \rceil) \\
 & + (1-p)q \text{ time}(\lfloor x \rfloor, \lceil y \rceil - 1) \\
 & + (1-p)(1-q) \text{ time}(\lfloor x \rfloor, \lceil y \rceil)
 \end{aligned}$$

where $t_{i,j}$ represents the seek time for a specific pair of logical volumes and time is the seek interval for the corresponding relationship.